

# Electrical Power Engineering (2)

**Code: EP2207**

**Lecture: 4**

**Tutorial: 4**

**Total: 8**

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**This course aims at providing the basic knowledge in order to:**

- **Know the overall representation of power systems and per-unit quantities**
  - **Realize the power circle diagrams**
  - **Recognize the network equations and solutions**
  - **Deal with the control of voltage and reactive power**
  - **Realize economics of power factor**
  - **Identify the high-voltage D.C. overhead transmission lines**
  - **Know the principles to underground cables**
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# Intended Learning Outcomes (ILOs)

## Knowledge and Understanding

- a1- Classify the representations of different types of transmission lines
  - a2- Identify the performance of using Power Circle Diagrams
  - a3- State the methods of Network Solutions
  - a4- Outline the Control of Voltage and Reactive Power
  - a5- Enumerate the components of High-voltage D.C. Overhead TLs
  - a6- Mention the methods of Power Factor Economics
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# Intended Learning Outcomes (ILOs)

## Intellectual Skills

- b1- Describe the function of each component of electric power systems
  - b2- Analyze the mathematical equations used to solve power system equations
  - b3- Demonstrate the control of voltage and reactive Power
  - b4- Deduce the mathematical equations related to economics of power factor
  - b5- Visualize the operation of underground cables
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# Intended Learning Outcomes (ILOs)

## Professional and Practical Skills

- c1- Illustrate the required Power Circle Diagrams of transmission lines
  - c2- Apply the Per-Unit method to solve power system problems
  - c3- Calculate the optimal power factor for certain loads
  - c4- Compute the equivalent capacitance of Underground Cables
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# Intended Learning Outcomes (ILOs)

## General and Transferable Skills

- d1- Cooperate to collect information about certain topics
  - d2- Report a main subject through defined groups
  - d3- Build self confidence
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# Weighting of Assessments (100)

Mid-term examination	10.0 %
Final-term examination	60 %
Oral examination.	20.0 %
Practical examination	0.0 %
Semester work	10.0 %
Other types of assessment	0.0 %
Total	100%

# References

- Dr. Ahmed M. Refaat, "Electric power engineering (2)", electrical power and machines department, faculty of engineering, Tanta university
  - I. J. Nagrath, D. P. Kothari , "Modern power system analysis", Tata McGraw-Hill Book Company, New Delhi, 1989, 2003
  - Chard ,F. de la C, "Power system engineering", Cleaver-Hume, London, 1962
  - Gupta ,B. R, "Power System Analysis and Design", S. Chand and Company, New Delhi, 1998
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# References

- P. S. R. Murty, "Power System Operation and control", P. S. R. Murty, New Delhi, 1984
  - I. J. Nagrath, D. P. Kothari, "Power system engineering", Tata McGraw-Hill Book Company, New Delhi, 2003
  - Mehta ,V. K, "Principles of Power System", S. Chand and Company, New Delhi, 1993
  - Saadat Hadi, "Power System Analysis", Tata McGraw-Hill Publishing Company LTD, New Delhi, 1999
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# Performance of long transmission lines

$r$ : is the resistance per unit length of the line

$l$ : is inductance per unit length of the line

$z$ : is impedance per unit length of the line

$c$ : is capacitance per unit length of the line

$y$ : is admittance per unit length of the line

$\theta$ : is the propagation constant      معامل الانتشار

$$\theta = \sqrt{zy}$$

# Performance of long transmission lines

$$\theta = \alpha + j \beta$$

$\alpha$ : is the attenuation constant      معامل التوهين

$\beta$ : is the phase constant

$Z_o$ : is the characteristic impedance of the line

$$Z_o = \sqrt{\frac{z}{y}}$$